



## Homework 1 Logic Gates

1. Draw a logic circuit representing the Boolean expression

$$Q = \neg (A \vee B) \wedge \neg (C \wedge D)$$

[2]

2. Figure 1 shows a logic circuit.

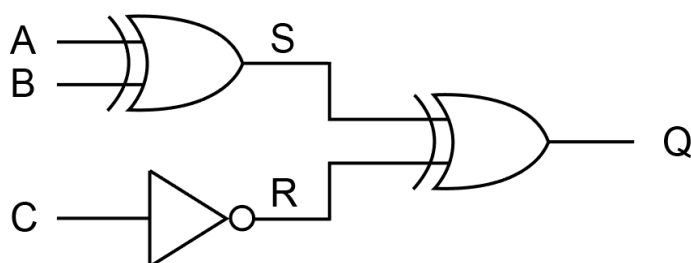


Figure 1

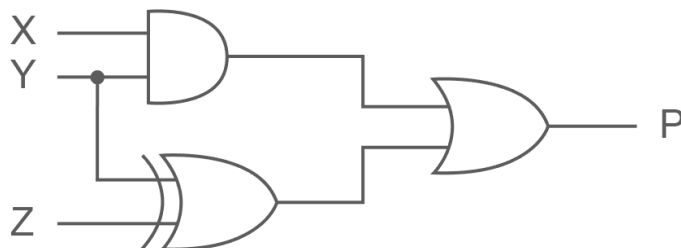
- (a) Complete the truth table below for the logic circuit shown in Figure 1.

[4]

Input A	Input B	Input C	S	R	Output Q
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			



3. (a) Write the Boolean expression corresponding to the following logic diagram.



- (b) What is the output P if X and Z are 1, Y is 0? [1]
4. A set of three sensors in a factory detects whether the pollution it is outputting from an incinerator exceeds safe limits, in which case the incinerator is shut down. An alarm (A) is sounded if at least two of the three sensors S1, S2 and S3 detects a pollution level above the limit.  
Draw a logic circuit for this system, showing inputs S1, S2 and S3 and output A. [4]

Draw a truth table corresponding to the logic circuit.

S1	S2	S3					
0	0	0					
0	0	1					
0	1	0					
0	1	1					
1	0	0					
1	0	1					
1	1	0					
1	1	1					

[4]

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## Unit 8 Boolean algebra



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[Total 15 marks]